Appendix 9

Proposed Offsite Well Downgradient of SDB-1

URS

February 24, 2003

Mr. Aaron Yue
Department of Toxic Substances Control
5796 Corporate Avenue
Cypress, California 90630

Re: Proposed Offsite Well Downgradient of SDB-1
Square D Company Facility
Beaumont, California

Dear Mr. Yue:

This letter provides the proposed technical approach and tentative schedule for the installation of an offsite groundwater monitoring well downgradient of existing onsite Well SDB-1 for the former Square D Company (Square D) facility located at 1060 East Third Street in Beaumont, California. This letter has been prepared by URS Corporation, on behalf of Square D Company, in response to the Consent Order (Docket HWCA 00/01-4014) indicating the need for an additional offsite well.

Proposed Well SDB-7B will be placed approximately 150 to 175 feet directly north of SDB-1 within the Union Pacific Railroad Company's (UPRR) right of way (to avoid placing the well within a slope, it may need to be located on the north side of the UPRR access road). The pilot borehole will be drilled to a total depth of approximately 235 feet below ground surface (bgs) using a reversed air circulation, dual wall-percussion hammer drilling method. During drilling, soil cuttings will be occasionally screened in the field for organic vapor emissions, using a photoionization detector (PID) for health and safety reasons. The boring will be continuously cored from about 210 to 235 feet bgs to evaluate the depth of first water and assess aquifer conditions. Groundwater is anticipated to occur at approximately 217 feet bgs.

Soil cuttings generated during drilling will be contained in a roll-off bin and profiled for disposal purposes. Four discrete soil samples will be collected by dividing the bin roughly in half and collecting two soil samples from each half of the bin – one from the upper portion of the bin, and the second from the lower portion of the bin. The samples will be collected in laboratory-supplied jars, and will be composited by the laboratory; the composite sample will be analyzed for Title 22 metals. Assuming the metals concentrations are below the residential cleanup levels established for Parcel 2 during the 1995 Corrective Action, the soil cuttings will be placed within the fire-break area on Parcel 3 located south of Third Street. If metals concentrations exceed these levels, the soils will be disposed offsite at an appropriate facility.

Well SDB-7B will be constructed in a manner similar to Well SDB-6B using Schedule 80 4-inch outside diameter PVC casing. A 20-foot long section of 0.020-inch slotted screen will be placed from approximately 5 feet above the water table to about 15 feet below. A filter pack consisting of Monterey #2/12 sand topped with approximately 3 feet of #60 silica sand will be placed in the annular space. An approximately 10-foot thick bentonite seal, consisting of 5 feet of bentonite pellets and 5 feet of bentonite slurry, will be placed above the silica sand. The bentonite pellets will

URS Corporation
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Santa Ana, CA 92705
Tel: 714.835.6886
Fax: 714.667.7147

be allowed to hydrate at least 1 hour prior to placement of the bentonite slurry. A 5 percent bentonite/neat cement grout will be placed in lifts in the annular space above the bentonite seal to the surface. The well will be completed with a locking stove-pipe monument box. The outside of the box will be labeled with appropriate contact information. Following completion, the wellhead will be surveyed and tied into the existing wells for calculation of the groundwater elevation and flow direction.

The well will be developed as described in the current Water Quality Sampling and Analysis Plan (WQSAP) dated February 24, 2003. Approximately two weeks after development, the well will be purged and sampled for the Group 2 groundwater monitoring parameters (total chromium, hexavalent chromium, hardness, specific conductance, sulfate, and total dissolved solids) using low-flow techniques as described in the WQSAP. Groundwater generated during well development and purging will be discharged to the City of Beaumont sanitary sewer.

As indicated above, the proposed offsite well will be located on UPRR property. The permitting process for entry onto the railroad's right of way for environmental investigation takes a minimum of 60 days to complete (see http://www.uprr.com/reus/environ/procedur.shtml). We will begin the permitting process upon DTSC concurrence of the above well installation, sampling, and analysis program. We anticipate installing the well within two weeks of receiving the Environmental Right of Entry from UPRR. The well will be developed approximately one week after well completion, then sampled approximately two weeks after development. A well completion report, including results of the groundwater sampling, will be submitted to DTSC within 30 days of well sampling.

Should you have any questions regarding this letter, please feel free to contact Ms. Gladys Thomas of Square D Company at 847-925-3203.

Sincerely,
URS Corporation

Laurie S. Fernandez, RG
Senior Geologist

cc: Ms. Gladys Thomas, Square D Company
Ms. Kathy San Miguel, DTSC
Ms. Carmelita Lampino, DTSC
Ms. Karen Baker, DTSC
Mr. Jim Wilkinson, DTSC

URS

October 31, 2007

Mr. Ju-Tseng Liu
Geology, Permitting and Corrective Action Branch
Department of Toxic Substances Control
5796 Corporate Avenue
Cypress, California 90630

Re: Amendment to Workplan For
Proposed Offsite Well Downgradient of SDB-1
Square D Company Facility
Beaumont, California

Dear Mr. Liu:

This letter is an amendment to the February 24, 2003 workplan, which provided the proposed technical approach and tentative schedule for the installation of an offsite groundwater monitoring well downgradient of existing onsite Well SDB-1 for the former Square D Company (Square D) facility located at 1060 East Third Street in Beaumont, California. This amendment has been prepared by URS Corporation, on behalf of Square D Company, in response to comments from the Department of Toxic Substances Control (DTSC) provided in a Memorandum dated August 4, 2003 from James Wilkerson to Kathy San Miguel.

The proposal offsite well will be completed within the railroad right-of-way located directly north of the former Square D facility. In the comments, the Geological Services Unit (GSU) indicated that the workplan should include a discussion of safeguards that will be instituted to protect the well from future activities along the railroad right-of-way. To safeguard the well, it will be completed with a locking stove-pipe monument box. The stove-pipe monument will be painted yellow so that it can be seen from a distance. The outside of the monument box will be clearly labeled with current Square D contact information. Note: at the recommendation of the DTSC GSU, the proposed offsite well will be referenced as SDB-7 (instead of SDB-7B as indicated in the February 24, 2003 workplan).

Additionally, the workplan indicated that a composite sample of the soil cuttings generated during drilling of the well borehole will be analyzed for Title 22 metals. Based on general facility requirements, the sample will also be analyzed for volatile organic compounds (VOCs) by EPA Method 8260B and total petroleum hydrocarbons (TPH) by EPA Method 8015M. The work plan indicated that the soil cuttings would be placed within the fire-break area on Parcel 3 located south of Third Street, assuming the metals concentrations are below the residential cleanup levels established for Parcel 2 during the 1995 Corrective Action. Since Square D no longer owns Parcel 3, the soil cuttings will be disposed offsite at an appropriate facility, based on the profiling analytical results.

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2020 East First Street, Suite 400
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Tel: 714.835.6886
Fax: 714.667.7147

Should you have any questions regarding this letter, please feel free to contact Mr. Curt Christensen of Square D Company at 402-421-4537.

Sincerely,
URS Corporation

Laurie S. Fernandez, P.G.
Senior Geologist

cc: Curt Christensen, Square D Company
Karen Baker, DTSC
Jim Wilkinson, DTSC

Appendix 10

Use of the Post Closure Cap for Pallet Storage and Forklift Traffic

APPENDIX 10

The Use of the Post Closure Cap

for

Pallet Storage and Forklift Traffic.

a. October 6, 2000 letter from Ms. Gladys Thomas of Schneider Electric to Mr. Ram Ramanujam of the Department of Toxic Substances Control.

b. April 14, 2003 letter from Ms. Gladys Thomas of Square D Company, Schneider Electric to Ms. Kathy San Miguel of the Department of Toxic Substances Control.

Schneider Electric

Gladys M. Thomas
Operations Manager, Safety, Health & Environmental Affairs
North American Division

October 6, 2000

Via Fax 916-323-3700

Mr. Ram Ramanujam
Department of Toxic Substances Control
381 Capitol Mall, 4th Floor
Sacramento, CA 95814

Dear Mr. Ramanujam:

Thank you for your attendance at our meeting on Wednesday, October 4. Per your request, attached please find a copy of the proposed operation of the cap. As you can see, we went with four quadrants instead of six. This was done to be conservative and to ensure the protection and integrity of the cap.

We look forward to receiving your letter indicating your review and approval of cap storage. We are hoping to begin storing pallets on the cap on Friday, October 13.

Thank you, once again, for your assistance.

Sincerely,

Gladys M Thomas

Gladys M. Thomas
Operations Manager
Safety, Health & Environmental Affairs

Enc.

cc: Karen Baker, DTSC - 714-484-5369
Theodore Johnson, DTSC - 714-484-5369
Carmelita Lampino, DTSC - 714-484-5369
Khaled Ramadan, DTSC - 714-484-5369
~~Ray Gutierrez, Commercial~~ Lumber - 909-769-9481
Laurie Fernandez, URS - 714-667-7147
Peggy Fortuna, Square D
Jerry Seaburg

Federal Pioneer
Merlin Gerin
Modicon
Square D
Telemecanique

STORAGE OF PALLETS
(SEE ATTACHED DIAGRAM)

- Pallets will be stored 2 ft. from the white raised berm
- Pallets will be transported utilizing a 6,000-pound forklift
- Pallets will be stacked 44 high
- Pallets will be rotated as indicated in the attached diagram

  Area #1 will be cleared and inspected in January, May and September
  Area #2 will be cleared and inspected in February, June and October
  Area #3 will be cleared and inspected in March, July and November
  Area #4 will be cleared and inspected in April, August and December

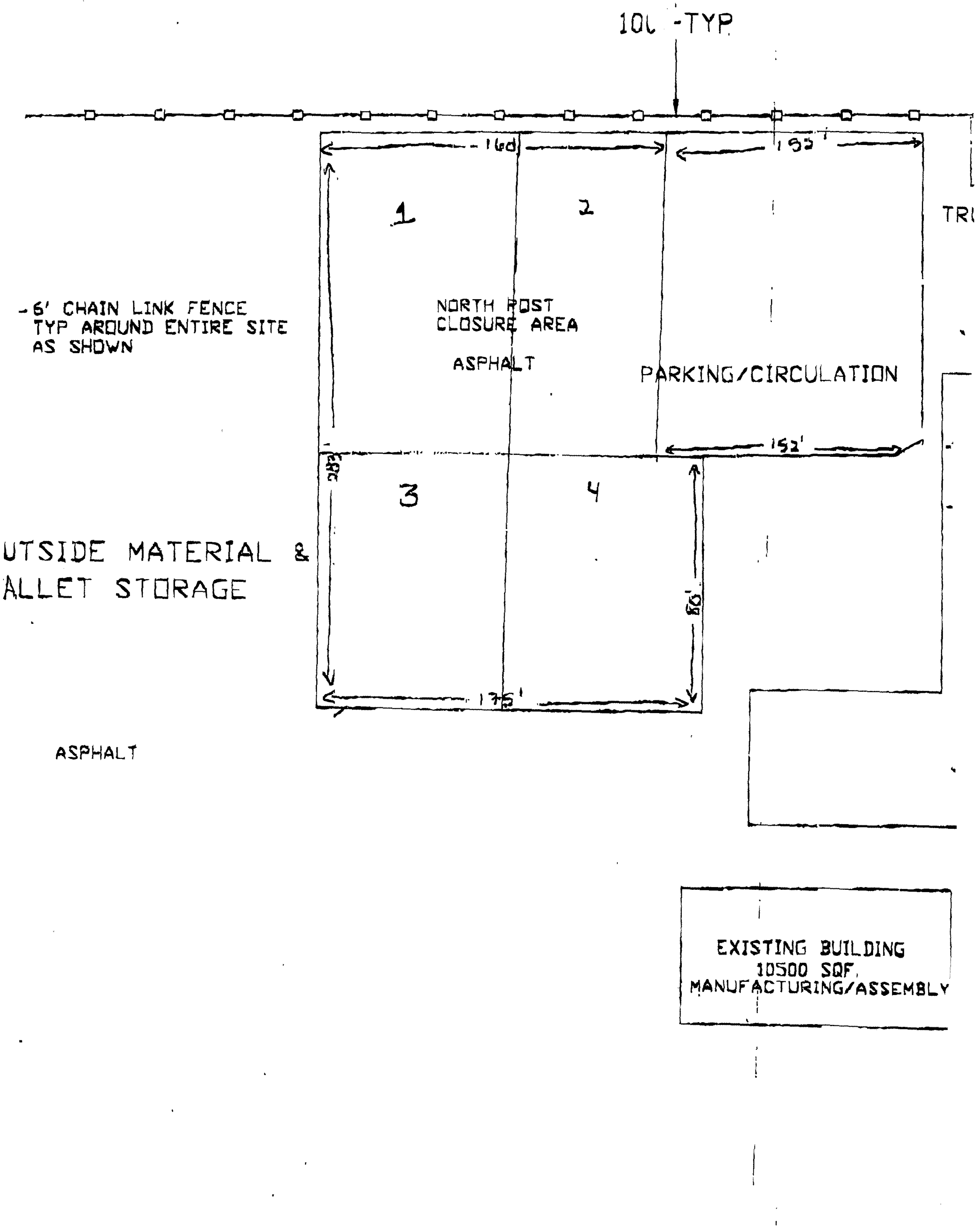
- All pallets will be removed once per year and a full inspection will be conducted.
- Square D will notify Commercial Lumber Pallet Company one week prior to the inspection date for the monthly inspections and three weeks prior to the annual inspection date.

SQUARE D COMPANY

- Square D will correct any deficiencies noted in the monthly inspections within 45 days.
- Square D will conduct annual maintenance in September of each year.

COMMERCIAL LUMBER & PALLET CO.

- Commercial Lumber Pallet Company will contact Square D immediately at 847-397-2600 (Gladys Thomas) if damage is done to the cap.



10' -TYP
TR
6' CHAIN LINK FENCE TYP AROUND ENTIRE SITE AS SHOWN
1
2
3
4
160'
152'
152'
175'
80'
NORTH POST CLOSURE AREA
ASPHALT
PARKING/CIRCULATION
UTSIDE MATERIAL & ALLET STORAGE
ASPHALT
EXISTING BUILDING
10500 SQF.
MANUFACTURING/ASSEMBLY

SQUARE D COMPANY
Schneider Electric
EXECUTIVE OFFICES
1415 SOUTH ROSELLE ROAD, PALATINE, IL 60067-7399 847-397-2600 FAX: 847-925-7500

April 14, 2003

Via Airborne Courier

Ms. Kathy San Miguel, P.E.
Hazard Substances Engineer
California EPA – DTSC
5796 Corporate Avenue
Cypress, CA 90630

Dear Ms. San Miguel:

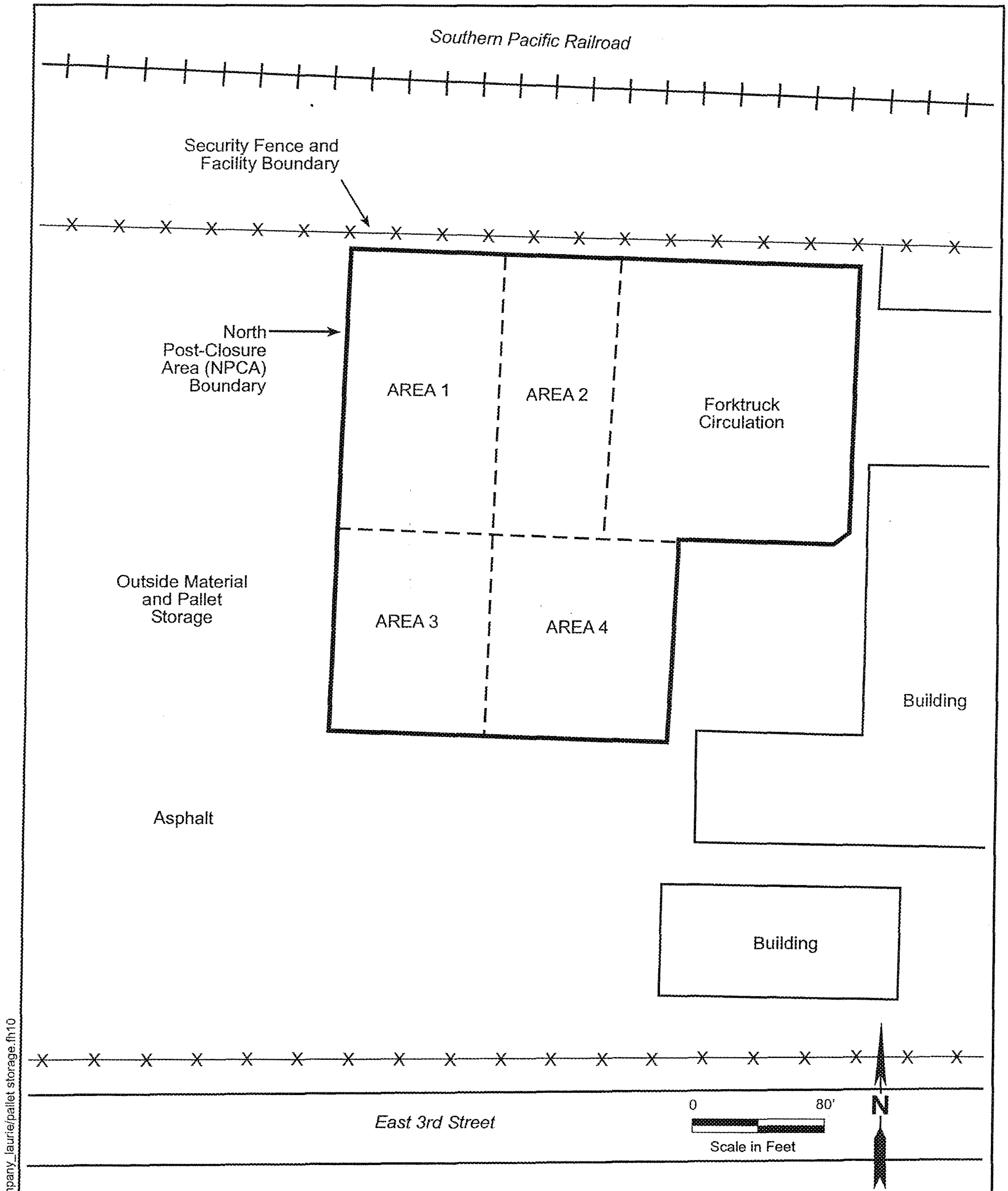
Here are the other documents you requested. The procedures are being approved by Commercial Lumber since they are also involved.

Sincerely,

Gladys M. Thomas

Gladys M. Thomas
Operations Manager
Safety, Security and Environment

Enc.



PALLET STORAGE NORTH POST - CLOSURE AREA

Project No.: 29864170	Date: MARCH 2003	Project: SQUARE D COMPANY BEAUMONT, CALIFORNIA	Figure 1

URS

Appendix 11

Revised Pavement Structural Section Evaluation for the Drive Area

TECHNICAL MEMORANDUM

URS

2020 E. First Street, #400
Santa Ana, CA 92705
714 835-6886 Tel
714 667-7147 Fax

To:	Curt Christensen, Square D Company
From:	Da Cheng Wu Garry Lay
cc:	Laurie Fernandez, URS
Date:	February 25, 2004
Project No.:	29864170.09150
Re:	Revised Pavement Structural Section Evaluation for the Drive Area, SE Corner – Former Square D Facility, Beaumont, California

INTRODUCTION

This memorandum summarizes URS Corporation's (URS') evaluation of the existing asphalt pavement section over the southeast corner of North Post-Closure Area (NPCA; site) at the former Square D Company (Square D) facility in Beaumont, California. The site is located west of Pennsylvania Avenue, and bounded by Third Street to the south and Southern Pacific Railroad to the north. The pavement area of concern is a drive area at the southeast corner of the NPCA. The evaluation was conducted to assess whether the pavement could handle the loading of 18-wheeler trucks.

URS' initial evaluation of the drive area pavement was documented in a Technical Memorandum dated December 11, 2001. The Department of Toxic Substances Control (DTSC) reviewed the 2001 Technical Memorandum and provided comments to Square D in a letter dated June 16, 2003. After discussions with DTSC during a conference call on September 4, 2003, URS, on behalf of Square D, responded to DTSC's comments on the pavement section evaluation in a draft Addendum Technical Memorandum dated September 15, 2003. The draft memorandum was sent informally to Mr. Ramanujam of DTSC via e-mail for discussion purposes. Based on the draft Addendum, DTSC requested a site meeting to further discuss their concerns. On November 5, 2003, URS and DTSC met at the site to discuss the pavement evaluation. Based on discussions during the meeting, URS submitted a revised Addendum Technical Memorandum to DTSC on December 10, 2003 via facsimile. During a conference call on January 14, 2004, DTSC provided further comments on the pavement evaluation based on their observations during the November 5, 2003 site visit and discussions with representatives of Caltrans. During the site visit, several surficial cracks in the asphalt of the drive area were observed indicating that the asphalt was experiencing some distress. DTSC indicated during the January 14, 2004 conference call that additional asphalt thickness was needed to support the truck traffic.

A draft response to DTSC's verbal comments received on January 14, 2004, was submitted to DTSC via e-mail on February 9, 2004. This last submittal was once again discussed with DTSC via teleconference on February 11, 2004.

This Technical Memorandum has incorporated responses to the various review comments raised by DTSC concerning the cover system's bearing capacity and the pavement structural evaluation, and includes the design of additional cover to support the truck traffic. The route of truck traffic is shown on Figure 1.

THE EXISTING CAP

The NPCA cap was constructed in 1988. According to the Closure Activities Report dated September 12, 1988, in the Post-Closure Permit Application Volume 8, prepared by SNR Company on December 4, 1990, the cap within the southeastern drive area consists of the following elements (from top down) over compacted clayey soil:

- 4 inches of asphalt concrete pavement
- 3 inches of Caltrans Class II aggregate base course
- 14 to 15 inches of clean washed sand
- 40-mil HDPE geomembrane
- 8 to 9 inches of clean washed sand
- 40-mil HDPE geomembrane

The section of the cover is shown on Figure 4A presented as Reference 1. Based on the Closure Activities Report prepared by SNR Company, the cap within the southeast drive area consists of the same elements as the elevated portions of the NPCA cap except for the perforated pipe system. The leak detection system (PVC piping) was not installed in this portion of the cap. Sand was placed between the membranes.

According to the Closure Activities Report, the R-value of the subgrade soil was tested to be 9, and the R-value of the sand layer above the subgrade was tested to be 73 (Reference 2). Also, the 40-mil HDPE membrane was tested for tensile strength. The tensile strength is over 2700 psi (Reference 3).

COVER ANALYSIS AND DESIGN

A. BEARING CAPACITY AND SETTLEMENT OF LANDFILL CAP AND THE INTEGRITY OF HDPE MEMBRANE

The truck traffic loading evaluation is provided in the Appendix, Sheet A1 through A3. URS concludes that the equivalent loading area is 22 inches by 7.1 inches on the top of the cover, with a pressure is 109 psi. The total cover thickness is 30 inches, as shown in Figure 4 on Sheet A3 in the Appendix. This load is assumed to be distributed through the cover layer to a bigger area of 52 inches by 37.3 inches, and the induced stress at the subgrade soil level is estimated to be 8.8 psi (1,270 psf), as shown on Sheet A4 of the Appendix.

The ultimate bearing capacity of the subgrade soil is 12,270 psf, as shown on Sheet A5 of the Appendix; therefore, the factor of safety against bearing capacity failure is adequate.

The settlement of the cover material is calculated as about 0.1 inch, as shown on Sheet A6 of the Appendix. URS concludes that this level of very small settlement will only cause minimal movement of soil around the HDPE membrane. Given the HDPE membrane has a tensile strength of over 2,700 psi (Reference 3), which is much greater than the level of stress in the underlying layers, the capacity of the HDPE membrane appears to be satisfactory.

B. EVALUATION OF PAVEMENT SUPPORT CAPACITY

The anticipated daily traffic over the drive area will consist of five to ten trips of 18-wheeler trucks, with a total load of 80 kips. The traffic index will be limited to 7 (Sheet A7 of the Appendix).

As shown in Sheet A7 of the Appendix, the required total Gravel Equivalent is 24.46 inches above the subgrade soil. The Gravel Equivalent of the existing asphalt and base is 11.86 inches as shown on Sheet A8. At the request of the DTSC, the 22 inches of sand beneath the aggregate base has not been considered in the evaluation. Therefore, the additional thickness of asphalt required to support the truck traffic is 5.88 inches.

CONCLUSIONS

Based on the calculations presented in this Technical Memorandum, an additional thickness of 5.9 inches of asphalt is required on top of the existing pavement to adequately support the upper-bound of anticipated daily truck traffic. The additional layer of asphalt will be placed along the drive area as shown on Figure 1. A work plan discussing the asphalt overlay specifications will be submitted to DTSC within 30 days.

The above conclusions assume that Square D will continue regular monthly inspections on the cap, and repairs, if required, will be conducted within 45 days of discovery. Particularly, no ponding of water should be allowed in this area, and cracks should always be repaired.

Truck traffic procedures will be documented in an Operations Plan. The procedures will be maintained at the site for implementation by the operating facility.

REFERENCES

1. Closure Plan, Prepared for Yates Industries, by SNR Company, May 20, 1988.
2. Post-Closure Permit Application, Volume 8, prepared by SNR Company, December 4, 1990, with the Closure Activities Report, prepared by SNR Company, September 12, 1988.
3. Quality Control Assurance, Gundle HD 40 mil, Test Results, January 4, 1988 (Also from Closure Activities Report, prepared by SNR Company, September 12, 1988)
4. Thickness Design, Asphalt Pavements for Highways and Streets, by Asphalt Institute, February 1991.
5. AASHTO Guide for Design of Pavement Structures, 1993
6. Road Engineering Journal, 1997
7. Foundation Engineering Handbook, Second Edition, by Hsai-Yang Fang, 2001
8. Principles of Foundation Engineering, Braja M. Das, 1984
9. Caltrans Highway Design Manual

Prepared by:

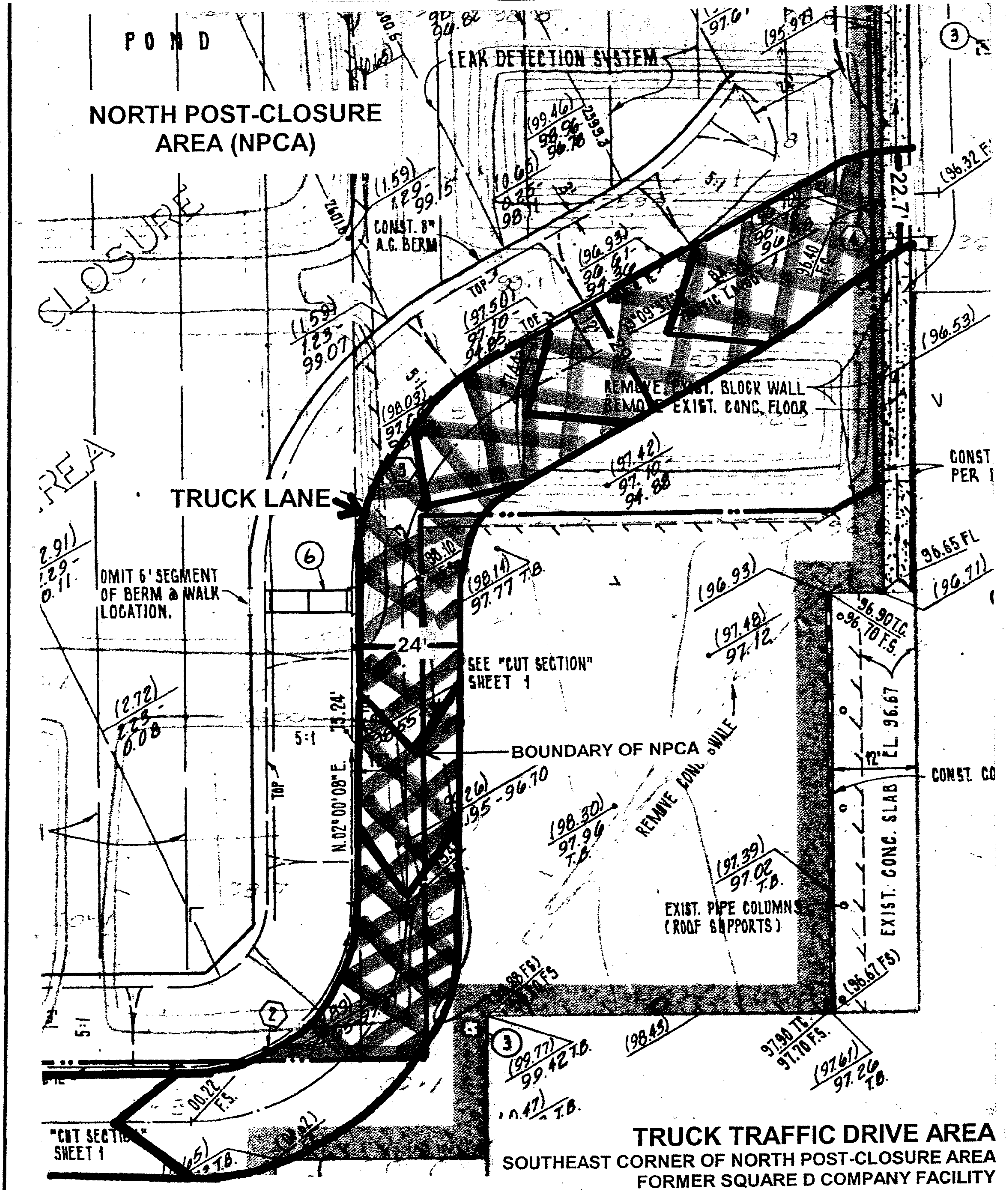
URS CORPORATION

Da Cheng Wu, P.E., G.E.
Senior Engineer

Reviewed and approved by:

URS CORPORATION

C. Garry Lay, P.E., G.E.
Manager of Geotechnical Engineering Division



TRUCK TRAFFIC DRIVE AREA
SOUTHEAST CORNER OF NORTH POST-CLOSURE AREA
FORMER SQUARE D COMPANY FACILITY
BEAUMONT, CALIFORNIA

APPROXIMATE SCALE: 1"= 30'

Additional Asphalt Layer

FIGURE 1

URS

Reference: As-Builts, 5-28-88, Final Grade Elevations, Sheet 2 of 2

TECHNICAL MEMORANDUM

APPENDIX

URS

Job: Square D | Project No.: | Page 1 of 8
Description: Bearing Capacity | Computed by: DCW | Sheet A1 of
| Checked by: | Date:
| | Date:

Reference

I. Bearing Capacity Calculation

1) Load from 18-wheeler truck, total weight = 80 kips.
Per Reference 4, the load on Axle 2 is <u>34</u> kips.

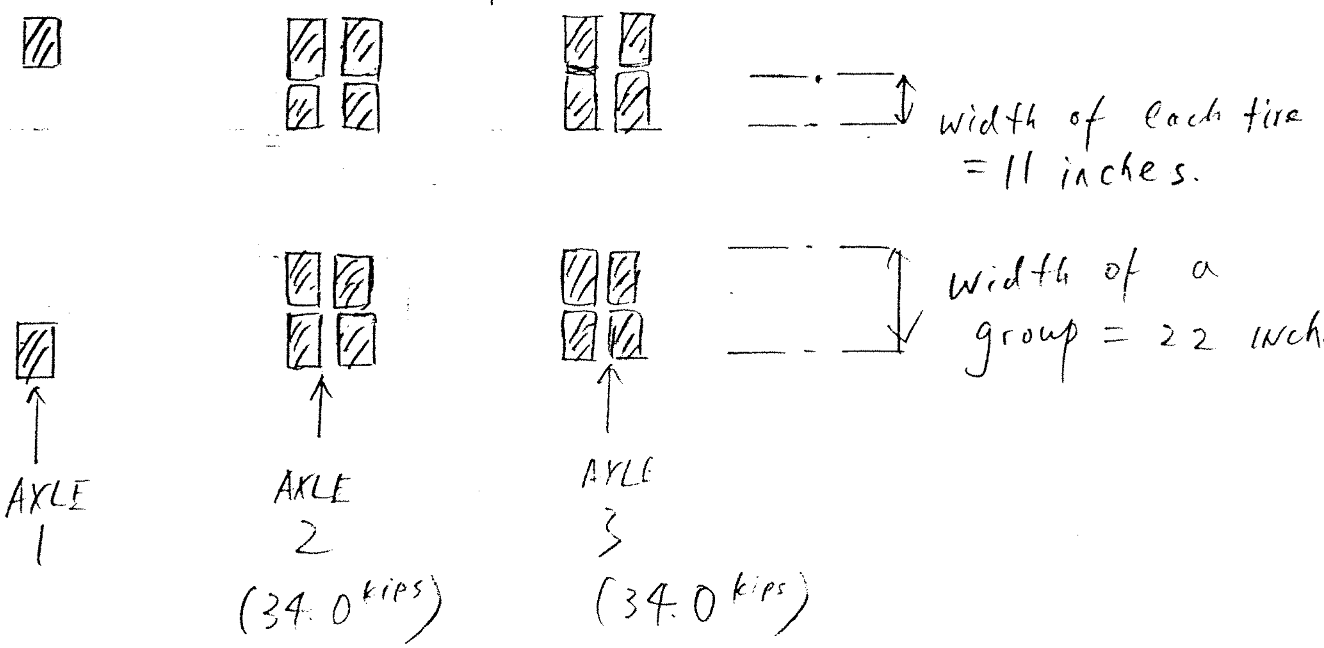
2-a) Load Distribution
As shown in Figure 2, with a total load of 34 kip
the load on one side is $34/2 = 17$ kips.

2-b) Width of Tire = 11 inches
Tire pressure = 109 psi
<Reference 5>

URS

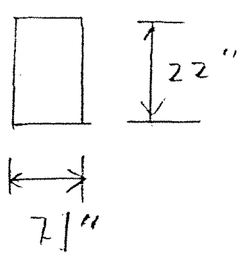
Job: Square D
Project No.:
Description: Bearing Capacity
Computed by: DCW
Checked by:
Date:
Date:
Reference

Figure 2 — Plan View of Truck Tires



For Axle 2 or Axle 3, there are 4 tires on each side

Figure 3 — Loading Area of Each Group



Total Area = 22" × 7.1" = 156 sq. IN

(see next page for explanation)

3)

Because on each side of the axle, the 4 tires are closely spaced, they are considered to act as a group.

Tire pressure = 109 psi

Width of each tire = 11 inches

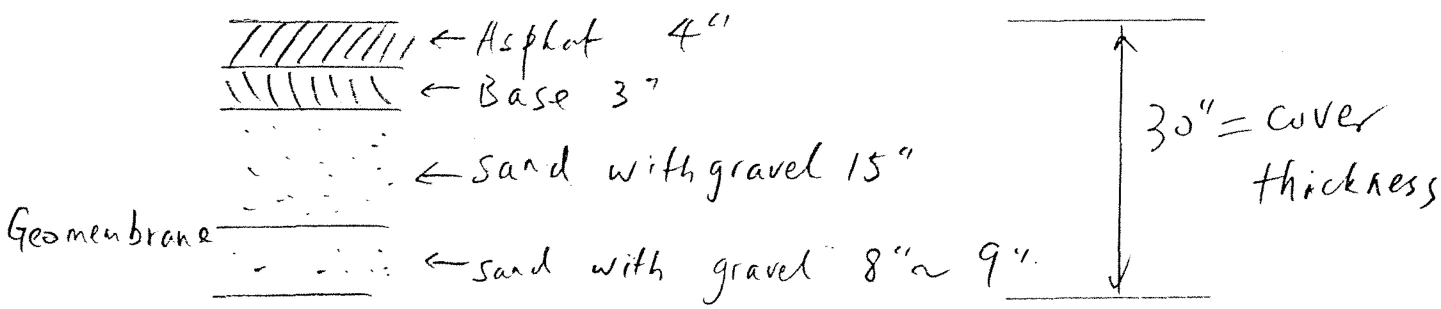
width of each group = 11 X 2 = 22 INches

Therefore, the area of loading of the 4-tire group is loading / pressure = $\frac{17.0 \text{ kips}}{109 \text{ psi}} = 156 \text{ IN}^2$

and the length of each group = $\frac{156}{22} = 7.1 \text{ IN}^3$

4) Cap structure is shown as the follows.

< Figure 4, Reference 1 >

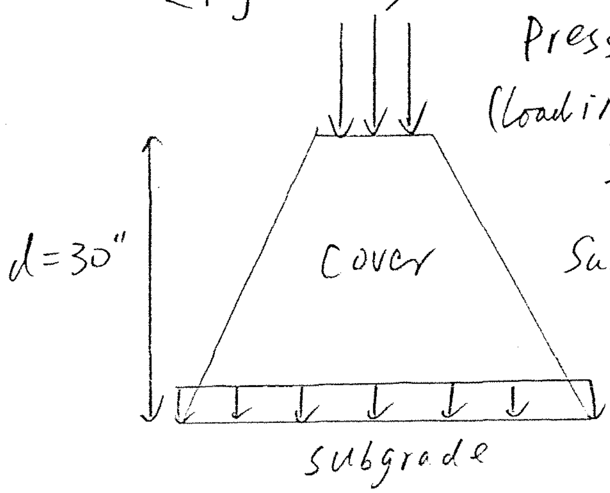


Subgrade soil (R = 9)

Total thickness of cover = 4" + 3" + 15" + 8" = 30"

5) Pressure distribution

<Figure 5>



Pressure on Top of cover = 109 psi (loading area: 22" by 7.1")

This pressure is distributed to Subgrade layer 30" below.

(loading area: 52" X 37.3")

Use 2:1 method, area at bottom of cover is (22" + 30") by (7.1" + 30"), i.e. 52" by 37.1"

therefore pressure at bottom of cover is

$$\text{Pressure on Top} \times \frac{\text{Top Area}}{\text{Bottom Area}} = \frac{22 \times 7.1}{52 \times 37.1} \times 109 \text{ psi} = 8.8 \text{ psi}$$

8.8 psi is equal to 1,270 psf

therefore, the load on subgrade is 1,270 psf

6) Strength and Bearing Capacity of Subgrade

With an R value of 9, $M_R = 1000 \times 555 \times 9 = 5995$ (Reference 6

With an $M_R = 5995$, the equivalent $CBR = 5995/1500 = 4$ (Reference 6,

Per Reference 7, the equivalent Modulus of Subgrade reaction is about 120 psi/in (pci)

By correlation from Reference 8.

the equivalent unconfined compressive strength (q_u) for very stiff clay ranges from 200 ~ 400 kN/m², which corresponds to a k value of 92 ~ 184 pci

Therefor, the q_u for subgrade can be assumed to be about 200 kN/m², which is equivalent to 4,200 psf

Therfore, Cohesion = 4200/2 = 2100 psf

Bearing Capacity $q = CN_c + qN_q + \frac{1}{2}\gamma B N_\gamma$

$N_q = 1$, $N_\gamma = 0$, $N_c = 5.7$ for clay (Reference 5)

Assume the unit weight of cover is 120 Lb/ft³

So $q = 2100 \times 5.7 + (30''/12'') \times 120 \times 1$

$= 11970 + 300 = 12270$ (psf)

7) Safety factor

$$FOS = \frac{q}{Load}$$

whereas $q = 12270$ psf from step 5)
Load = 1270 psf from step 4)
Therefor FOS = 12270/1270 = 9.7

8) Settlement $S_e = \frac{B q_0}{E_s}(1 - \mu_s^2)\alpha_w$ (Reference 8)

$B = 37.1''$ (loading are = 52" by 37.1")
$q_0 = 8.8$ psi
$E_s = 3500$ psi (Reference 8)
$\mu_s = 0.3$ (Reference 8)
$\alpha_w = 1.1$ (Reference 8)

Therefore $S_e = \frac{37.1'' \times 8.8\,psi}{3500\,psi}(1 - 0.3^2) \times 1.1$

$= 0.093 \times 0.91 \times 1.1 = 0.085$ (IN)

$\approx$ 0.1 (IN)

II) Cover Thickness Design

Per Reference 9, (Caltran's Highway Design Manual)

1) TI = Traffic Index of 18-Wheeler truck traffic

Upper bound daily trucks = 10

EASL 20-year Constant = 13780

(Vehicle type : 5- axle trucks)

Total 20-year EASL = 13780 X 10 = 137,800

Corresponding $TI = 9 \times (137800/10^6)^{0.119} = 7$

2) R-Value of Subgrade = 9 (Reference 2)

Required total Gravel Equivalent = $0.0032 \times 7 \times (100 - 9) = 2.0384'$

$= \underline{24.46''}$

Per DTSC, sand layer below cap is ignored

Therefore, existing GE = GE of Asphalt + GE of Base

Gravel factor for Asphalt = 2.14 (Reference 9)

" Base = 1.1 "

URS

Job Square D

Project No.

Sheet A8 of

Description Cover Design

Computed by DCW

Date

Checked by

Date

Reference

Existing GE = 4" of AC X 2.14 + 3" of Base X 1.1

= 4" X 2.14 + 3" X 1.1

= 11.86"

Additional GE Required = 24.46" − 11.86"

= 12.6"

therefore, additional AC thickness = 12.6/2.14

= 5.88"

REFERENCES

SNR COMPANY

CLOSURE PLAN

Prepared for:
Yates Industries, Inc.
Beaumont, California

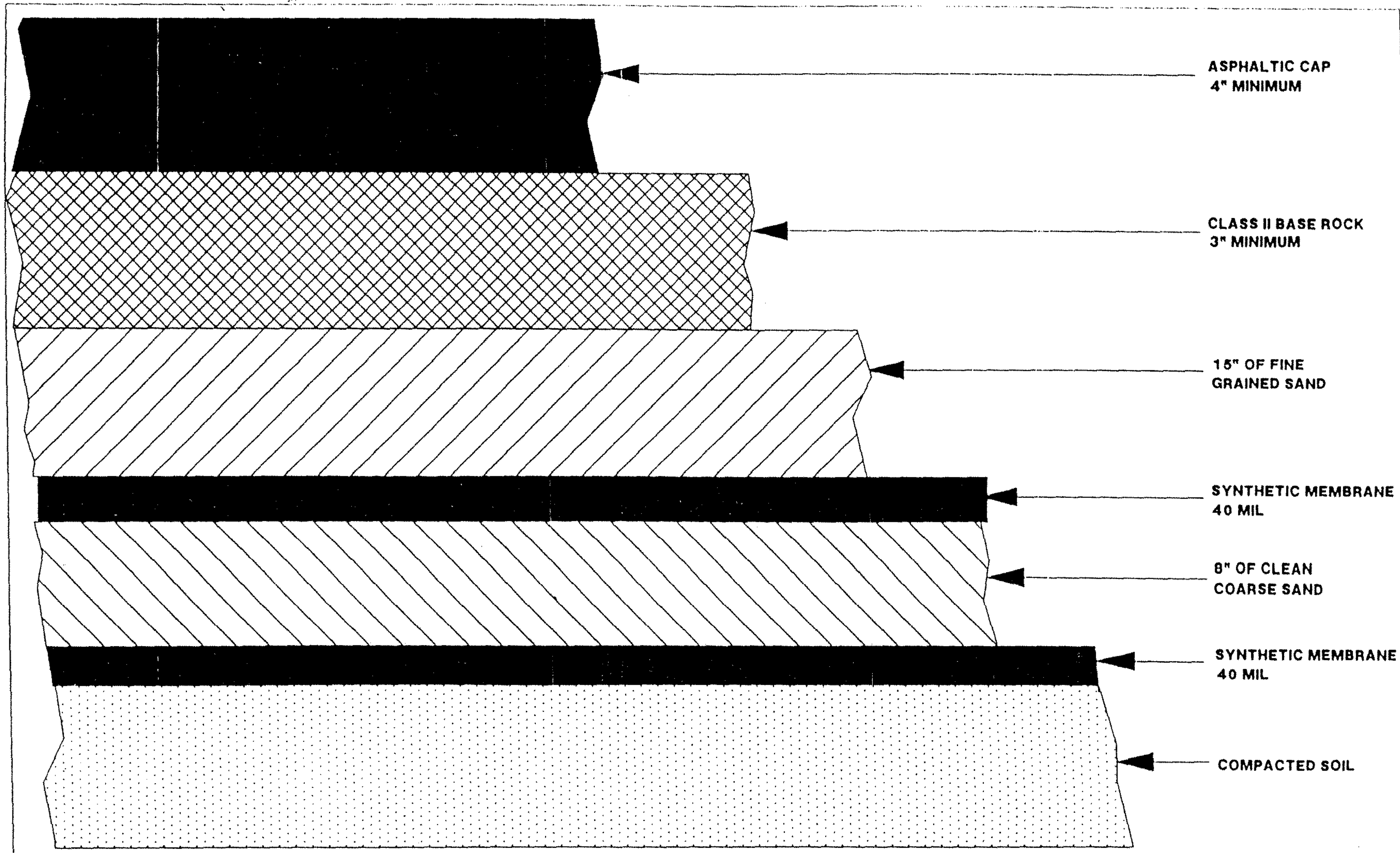
Prepared by:
SNR Company
25301 Cabot Road, Suite 212
Laguna Hills, California 92653

Received by:
California State Department of Health Services
Toxic Substances Control Division
107 South Broadway, Room 7001
Los Angeles, California 90012

May 20, 1988

Reference 1

25301 Cabot Road, Suite 212 • Laguna Hills, CA 92653 • (714) 859-9980



SNR COMPANY Geotechnical & Environmental Consultants	PROFILE OF CAP AND MOISTURE BARRIER– NORTH POST CLOSURE AREA	FIGURE 4A

POST-CLOSURE PERMIT APPLICATION VOLUME 8

CLOSURE ACTIVITIES REPORT (SEPTEMBER 12, 1988)

POST-CLOSURE PLAN (DECEMBER 4, 1990)

Prepared for:
Square D Company
Beaumont Facility
Beaumont, California

Project#: 794

Prepared by:
SNR Company
Laguna Hills, California

December 4, 1990

Reference 2

were analyzed for total metal concentrations and metal concentrations in leachate from the California Assessment Manual (CAM) Wet Extraction Test (WET). Results of the analyses indicate that total metal concentrations for the contaminant of concern, copper, are generally below the established background level of 30 mg/Kg. Additionally, total metal results for all metals tested are well below the respective Total Threshold Limit Concentrations (TTLC's), and all CAM WET results are well below respective Soluble Threshold Limit Concentrations (STLC's). TTLC's and STLC's are defined in Title 22, Article 11 of the California Code of Regulations.

2.5 MOISTURE BARRIER AND CAP - NORTH POST CLOSURE AREA

R-Value testing was conducted in accordance with ASTM 2844 on three representative samples of soil at subgrade elevation and on the fine-grained sand used as part of the moisture barrier. The test results are presented in Appendix B. The asphalt cap proposed in the Closure Plan, dated May 27, 1988, was designed in accordance with the California Highway Design Manual using a Traffic Index of 7 and R-Values of 9 for the subsoil and 73 for the fine-grained sand.

Gundle

QUALITY CONTROL ASSURANCE

GUNDLINE HD

MATERIAL GUNDLINE HD 40mil

DATE 01/04/88

BATCH # 0104

PROJECT SERROT CORPORATION

YATES INDUSTRIES

ROLL # 28089

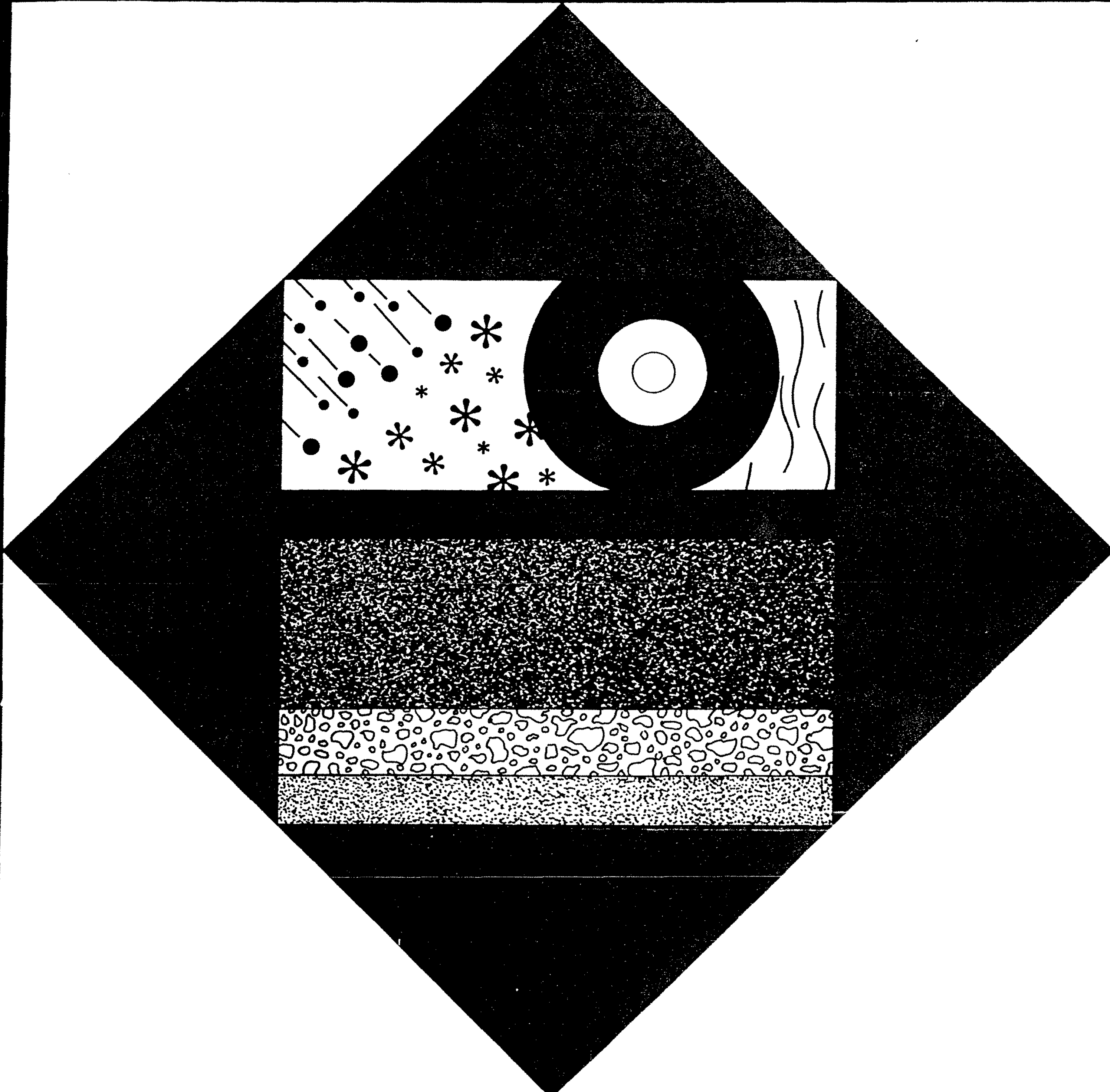
TEST PARAMETER	REQUIRED SPECIFICATIONS	TEST RESULTS	ASTM TEST METHOD
Thickness, mils	40 ± 10%	40	D 1593
Density, g/cm^3	.94	.951	D 1505
Melt Flow Index, g/10 min.	0.3 max.	.18	D 1238, E
Tensile Strength (psi)			D 638 Type IV 2 ipm
Yield	2333	2748	
Break	4000	4681	
Percent Elongation			D 638
Yield	13	14	
Break	700	769	
Percent Carbon Black	2.0	2.8	D 1603

CERTIFIED BY:

Sengthong Phouangsavanh
Lab Technician

Mark Cadwallader
Director of Research &
Technical Development

Reference 3



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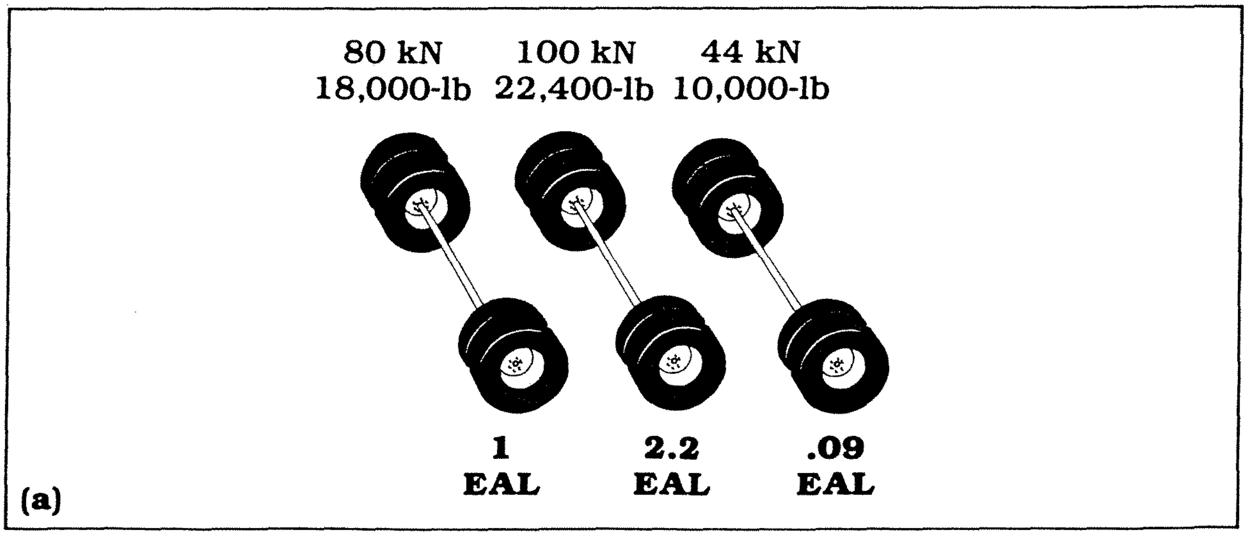

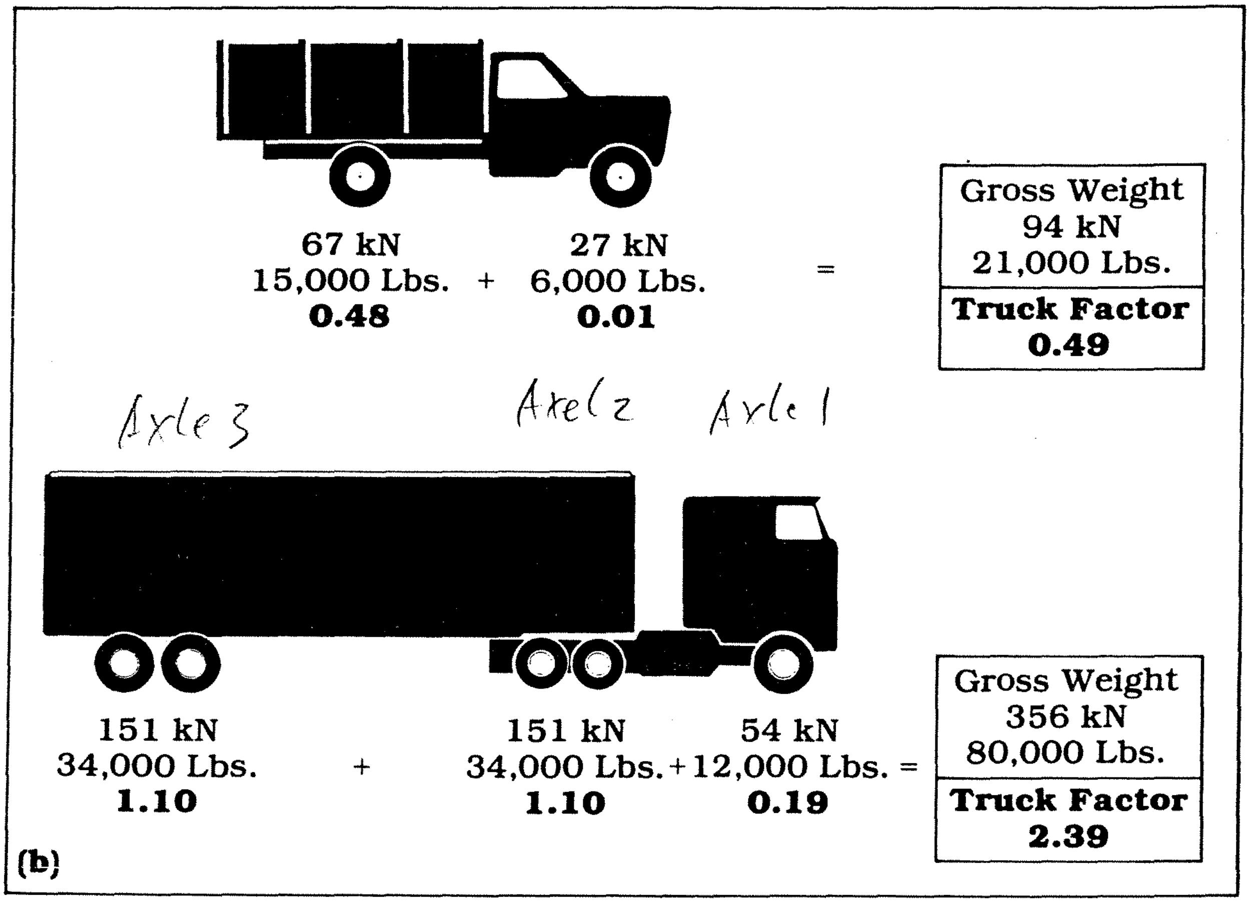

Figure IV-1. Load Equivalency Factors

Road Engineering Journal

December 1, 1997
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Oregon Study Looks at Potential Pavement Damage from High-Pressure Truck Tires and Single-Tired Axles

In the 1980s, trends in truck-tire configurations, tire types, and tire pressures began to concern U.S. pavement engineers because of the potential for pavement damage. As a result, a 1992 study sought to "(a) determine the extent and pattern of use of single and high pressure tires in Oregon and (b) determine the pavement impacts of the use of single and high-pressure tires." C. A. Bell, S. U. Randhawa, and Z. K. Xu discussed the results of the study in "Impact of High-Pressure Tires and Single-Tired Axles in Oregon" (Transportation Research Record 1540). They concluded that no significant changes in tire pressures have occurred since 1986, nor is there any apparent need to control tire pressures. They further concluded that while a significant change in the use of single tires has not occurred, the practice of "partial singling out needs to be controlled and perhaps eliminated completely." "Singling out" is "the practice of using only one tire on axles having hubs for two tires."

METHODS

The study involved an Oregon-based literature review of single-tired axles and tire pressures, a data collection plan that included new collection sites and a larger sample size, a data analysis, and a results comparison with other studies to estimate trends. The data collection sites were five ports of entry (POE) identified by the Oregon State Highway Division (OSHD) as representative of the trucks using different highways in the state. Data were collected at all five sites at different times of the year "to determine seasonal trends in truck dynamics." A total of 634, 564, and 507 trucks were surveyed in March, June, and September of 1992, respectively.

RESULTS

The majority of trucks surveyed (72 percent) were the 3-S2 type. This is the truck configuration commonly called an "18-wheeler"--a "tractor" with a semi-trailer. Single units (smaller, one-piece vehicles) and trucks with trailers (a single-unit truck combined with one or more trailers) made up the remaining surveyed vehicles.

Most tires on surveyed trucks were radials, primarily 11-inch-wide tires and 22.5-inch or 24.5-inch wheels. Trucks with single tires on steering axles were not counted as singled-out

Reference 5

trucks. At the five survey sites, 8.4 percent of the trucks had at least one axle using single tires, and most of these were singled out. This corroborated findings from studies conducted in 1986 and 1989. Results from the current survey suggested that singling out correlated with weight; most of the trucks using singling out were carrying lightweight products such as paper or food, or traveling empty. Of note was the "significant degree of singling out of tridem axles (about 40 percent in March and June surveys and almost 90 percent in the September survey), with a tendency for singling out to occur on the lead axle."

The tire pressure portion of the study measured actual and recommended tire pressures for both steering and nonsteering axles. Results revealed that "actual pressures were higher than the recommended pressures and have a much larger spread on both the steering and nonsteering axles." Actual pressures were skewed to the right, while recommended pressures tended to skew to the left; the difference reflected the significant number of tires carrying pressures higher than recommended. Results showed the mean tire pressure to be 109 pounds per square inch (psi) for steering axles, 102 psi for nonsteering axles, 105 psi for singled-out tires, and approximately 120 psi for wide-base tires. These results were similar to results from earlier studies. The current study also verified the declining trend in the use of bias tires--from 12.9 percent in 1986 to 9.9 percent in 1989 to 1.2 percent in 1992.

Pavement Impacts

Traffic loads and environmental conditions cause pavement damage. The damage caused by traffic is influenced by the total contact area between the tire and the pavement-more contact between the tire and pavement results in less damage to the pavement.

In analyzing trucks with five and six axles, results showed that "singling out of tandem axles does not appear to be particularly detrimental" to pavement, and "singling out of tridems is detrimental only when compared with a similarly loaded dual-tired tridem." As tire size increases, the damage potential from tridem axles decreases. For example, "tridem axles with wide-base tires can carry 42,000 lb and have a lower damage potential than a tandem axle loaded to 34,000 lb."

The study also compared trucks with seven and eight axles using wide-base single tires to those using regular dual tires on single axles. Results indicated that "in terms of the load carried, these trucks tend to be less damaging than those with fewer axles."

The partially singled-out tandem axle was found to be "particularly damaging." While this finding was significant, it "is not surprising, since a full 34,000-lb load can be carried legally with such an arrangement, resulting in two very concentrated wheel loads of 5,666 lb in proximity." In addition, the suspension system of a partially singled-out tandem axle truck "may not be capable of distributing the load evenly to all the tires in the group. Thus, higher loads could result on the singled-out tires in such situations." Analysis of partially singled-out tridem axles suggested that the potential pavement damage is not as severe as with the partially singled-out tandem axle.

CONCLUSIONS / RECOMMENDATIONS

Tire pressures and the use of single tires have not changed appreciably in Oregon since 1986. However, "the proportion of vehicles using single tires (7 percent) merits detailed evaluation, particularly those using partial singling out." The extent of the problem of partial singling out is such that the practice "needs to be controlled and perhaps eliminated completely." Eliminating this practice for trucks with tandem axles presents the simplest and least intrusive option, since the practice is rarely used.

Regardless of axle type, "the use of single tires results in a greater damage potential, relative to a similarly loaded dual-tired axle. Singling out of 11-in. dual tires is much more damaging than the use of wide-base tires."

Results also indicated that "tandem axles with single tires are less damaging than comparably loaded single axles with dual tires. Similarly, tridem axles with single tires are less damaging than similarly loaded tandem axles with dual tires. Overall, "singling out of all of the dual tires in a tandem or tridem axle is a less serious problem" and "should not be eliminated because in several instances such axles are less damaging than other alternatives." This practice may warrant some control, but the trend toward the use of larger axle groups should not be discouraged.

In addition, analysis showed that "wide-base single tires are potentially more damaging than comparably loaded dual tires"; however, "the use of wide-base tires is without doubt preferable to the use of singled-out conventional tires and incentives could be introduced to encourage their use on tridem axles." For both singled-out and wide-base tires, "Oregon may wish to consider a modification to the mileage tax rates and axle-weight mile schedules. Simple adjustments could be developed on the basis of the number of tires used in an axle group and the tire width."

For guidance, trucking practices in the U.S. could look abroad. In Europe, where wide base tires (approximately 14 inches or more) are permitted in place of duals at the same load levels, singling out is not allowed; and using single tires with tridem axles is a common practice. Overall, the impact of single tires on pavement, particularly with multiple-axle groups, warrants more research and critical field tests.

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AASHTO® Guide for Design of Pavement Structures 1993

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444 N. Capitol Street, N.W., Suite 249
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Reference 6

(2) Methods for the determination of M_R are described in AASHTO Test Method T 274.
(3) It has been recognized internationally as a method for characterizing materials for use in pavement design and evaluation.
(4) Techniques are available for estimating the M_R properties of various materials in-place from nondestructive tests.

It is recognized that many agencies do not have equipment for performing the resilient modulus test. Therefore, suitable factors are reported which can be used to estimate M_R from standard CBR, R-value, and soil index test results or values. The development of these factors is based on state of the knowledge correlations. It is strongly recommended that user agencies acquire the necessary equipment to measure M_R. In any case, a well-planned experiment design is essential in order to obtain reliable correlations. A range of soil types, saturation, and densities should be included in the testing program to identify the main effects. Guidelines for converting CBR and R-value to M_R are discussed in this chapter. These correlations are used in Part II of this Guide pending the establishment of agency values.

Heukelom and Klomp (*6*) have reported correlations between the Corps of Engineers CBR value, using dynamic compaction, and the in situ modulus of soil. The correlation is given by the following relationship:

$$M_R(\text{psi}) = 1{,}500 \times \text{CBR} \qquad (1.5.1)$$

The data from which this correlation was developed ranged from 750 to 3,000 times CBR. This relationship has been used extensively by design agencies and researchers and is considered reasonable for fine-grained soil with a soaked CBR of 10 or less. Methods for testing are given in Appendix F. The CBR should correspond to the expected field density.

Similar relationships have also been developed by the Asphalt Institute (*7*) which relate R-value to M_R as follows:

$$M_R(\text{psi}) = A + B \times (\text{R-value}) \qquad (1.5.2)$$

where

A = 772 to 1,155 and
B = 369 to 555.

For the purposes of this Guide, the following correlation may be used for fine-grained soils (R-value less than or equal to 20) until designers develop their own capabilities:

$$M_R = 1{,}000 + 555 \times (\text{R-value}) \qquad (1.5.3)$$

This discussion summarizes estimates for converting CBR and R-values to a resilient modulus for roadbed soil. Similar information is provided for granular materials in Section 1.6, Materials of Construction.

Placement of roadbed soil is an important consideration in regard to the performance of pavements. In order to improve the general reliability of the design, it is necessary to consider compaction requirements. For average conditions it is not necessary to specify special provisions for compaction. However, there are some situations for which the designer should request modifications in the specifications.

(1) The basic criteria for compaction of roadbed soils should include an appropriate density requirement. Inspection procedures must be adequate to assure that the specified density is attained during construction. If, for any reason, the basic compaction requirements cannot be met, the designer should adjust the design M_R value accordingly.
(2) Soils that are excessively expansive or resilient should receive special consideration. One solution is to cover these soils with a sufficient depth of selected material to modify the detrimental effects of expansion or resilience. Expansive soils may often be improved by compaction at water contents of 1 or 2 percent above the optimum. In some cases it may be more economical to treat expansive or resilient soils by stabilizing with a suitable admixture, such as lime or cement, or to encase a substantial thickness in a waterproof membrane to stabilize the water content. Information concerning expansive soil is covered in Reference 8. Methods for evaluating the potential consequences of expansive roadbed soils are provided in Appendix G.
(3) In areas subject to frost, frost-susceptible soils may be removed and replaced with selected, nonsusceptible material. Where such soils are too extensive for economical removal, they may be covered with a sufficient depth of suitable material to modify the detrimental effects of freezing and thawing. Methods for evaluat-

FOUNDATION ENGINEERING HANDBOOK

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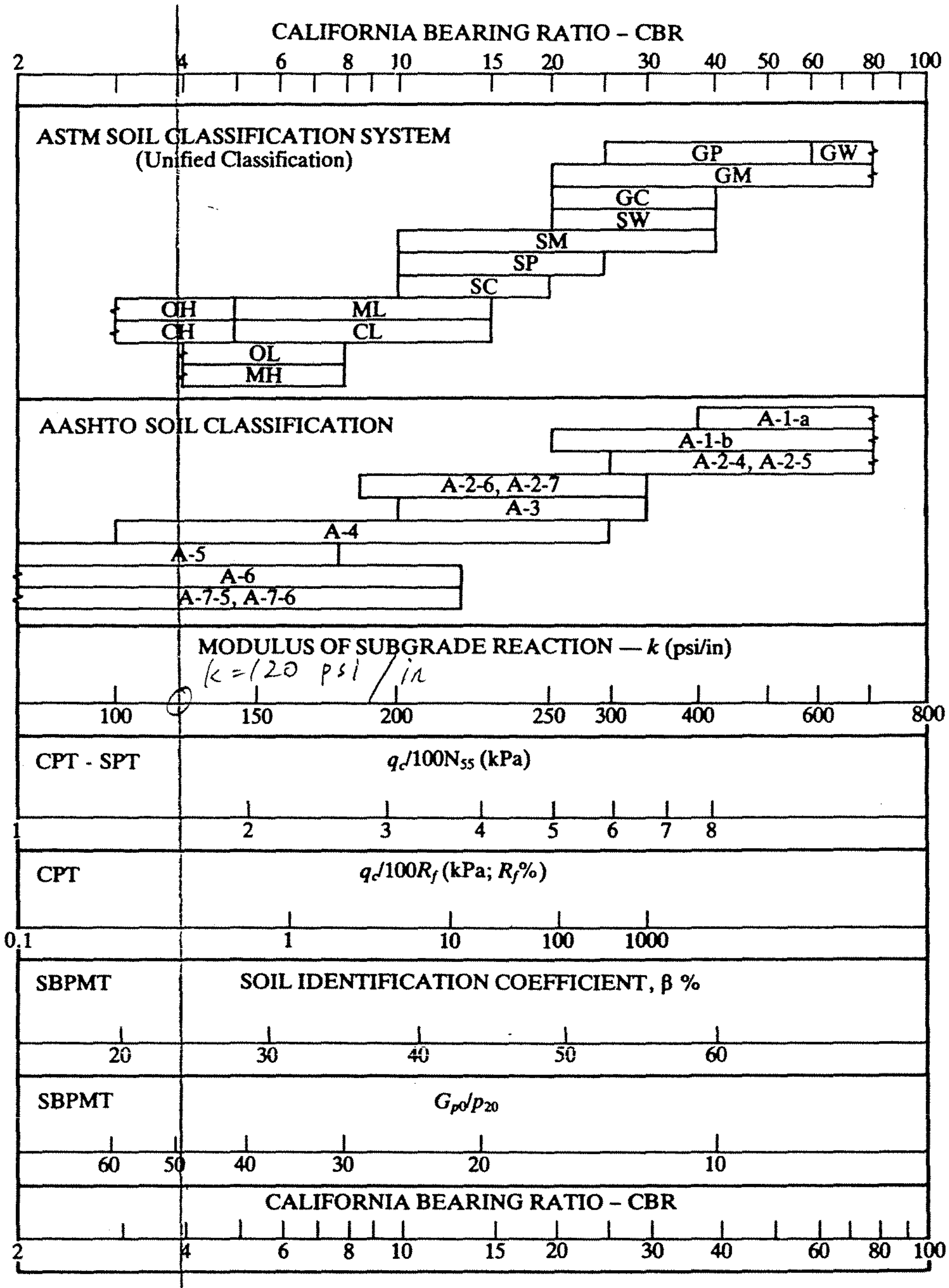

Fig. 3.37 Chart for approximate interrelationships between soil classification, bearing values, and some in-situ parameters: q_c, cone tip bearing; N_{55}, SPT blow count/ft; R_f, friction ratio (percent); G_{p0}, shear modulus at 0 percent strain; p_{20}, pressure at 20 percent strain; CBR, California Bearing Ratio. (*After Pamukcu and Fang, 1989.*)

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Principles of Foundation Engineering

Braja M. Das

Professor and Chairman
Department of Civil Engineering and Mechanics
Southern Illinois University at Carbondale

PWS-KENT PUBLISHING COMPANY
Boston, Massachusetts

Reference 8

square plates measuring 0.3 m × 0.3 m (1 ft × 1 ft), and values of k can be calculated. The value of k can be related to large foundations measuring $B \times B$ as follows:

Foundations on Sandy Soils:

$$k = k_{0.3}\left(\frac{B + 0.3}{2B}\right)^2 \tag{4.38}$$

where $k_{0.3}$ and k = coefficients of subgrade reaction of footings measuring 0.3 (m) × 0.3 (m) and B (m) × B (m), respectively (unit kN/m³).

Foundations on Clays:

$$k\ (\mathrm{kN/m^3}) = k_{0.3}\ (\mathrm{kN/m^3})\left[\frac{0.3\ (\mathrm{m})}{B\ (\mathrm{m})}\right] \tag{4.39}$$

The definition of k in Eqs. (4.39) is the same as that given in Eq. (4.38).

For rectangular foundations having dimensions of $B \times L$ (for similar soil and q)

$$k = \frac{k_{(B\times B)}\left(1 + \frac{B}{L}\right)}{1.5} \tag{4.40}$$

where k = coefficient of subgrade modulus of the rectangular foundation ($L \times B$)

$k_{(B\times B)}$ = coefficient of subgrade modulus of a square foundation having dimension of $B \times B$

The preceding equation indicates that the value of k of a very long foundation with a width B is approximately equal to $0.67k_{(B\times B)}$.

The Young's modulus of granular soils increases with depth. Because of the fact that the settlement of a foundation is dependent on the Young's modulus, the value of k increases as the depth of the foundation increases.

Following are some typical ranges of value for the coefficient of subgrade reaction $k_{0.3}$ for sandy and clayey soils.

Sand (dry or moist)
Loose: 8–25 MN/m³ (29–92 lb/in.³)
Medium: 25–125 MN/m³ (91–460 lb/in.³)
Dense: 125–375 MN/m³ (460–1380 lb/in.³)
Sand (saturated)
Loose: 10–15 MN/m³ (38–55 lb/in.³)
Medium: 35–40 MN/m³ (128–147 lb/in.³)
Dense: 130–150 MN/m³ (478–552 lb/in.³)
Clay
Stiff (q_u = 100–200 kN/m²): 12–25 MN/m³ (44–92 lb/in.³)
Very stiff (q_u = 200–400 kN/m²): 25–50 MN/m³ (92–184 lb/in.³)
Hard (q_u > 400 kN/m²): > 50 MN/m³ (> 184 lb/in.³)

(*Note:* q_u = unconfined compression strength)

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Table 3.4 Elastic Parameters of Various Soils

Type of soil	Young's modulus, E_s MN/m^2	Young's modulus, E_s lb/in.^{2}	Poisson's ratio, μ_s
Loose sand	10.35– 24.15	1,500– 3,500	0.20–0.40
Medium dense sand	17.25– 27.60	2,500– 4,000	0.25–0.40
Dense sand	34.50– 55.20	5,000– 8,000	0.30–0.45
Silty sand	10.35– 17.25	1,500– 2,500	0.20–0.40
Sand and gravel	69.00–172.50	10,000–25,000	0.15–0.35
Soft clay	2.07– 5.18	300– 750	
Medium clay	5.18– 10.35	750– 1,500	0.20–0.50
Stiff clay	10.35– 24.15	1,500– 3,500	

$$E_s(\text{kN/m}^2) = 766N \tag{3.66}$$

$$E_s = 2q_c \tag{3.67}$$

where N = standard penetration number
q_c = static cone penetration resistance

Note: Any consistent set of units can be used in Eq. (3.67).

The Young's modulus of normally consolidated clays can be estimated as

$$E_s = 250c \text{ to } 500c \tag{3.68a}$$

For overconsolidated clays

$$E_s = 750c \text{ to } 1000c \tag{3.68b}$$

where c = undrained cohesion of clayey soil

Example 3.7

Figure 3.16a shows a shallow foundation on a deposit of sandy soil that is 3 m × 3 m in plan. The actual variation of the values of Young's modulus with depth determined by using the standard penetration numbers and Eq. (3.66) are also shown in Figure 3.16a. Using the strain influence factor method, estimate the elastic settlement of the foundation after five years of construction.

Solution

By observing the actual variation of Young's modulus with depth, one can plot an estimated idealized form of the variation of E_s, as shown in Figure 3.16a. Figure 3.16b shows the plot of the strain influence factor. The following table can now be prepared.

Depth (m)	Δz (m)	E_s (kN/m^2)	Average I_z	$\frac{I_z}{E_s}\cdot\Delta z$ (m^3/kN)
0–1	1	8,000	0.233	0.291×10^{-4}
1.0–1.5	0.5	10,000	0.433	0.217×10^{-4}
1.5–4	2.5	10,000	0.361	0.903×10^{-4}
4.0–6	2	16,000	0.111	0.139×10^{-4}
				$\Sigma = 1.55 \times 10^{-4}$

construction of the structure. Consolidation settlement is time dependent and takes place as the result of extrusion of the pore water from the void spaces of saturated clayey soils. The total settlement of a foundation is the sum of the elastic settlement and the consolidation settlement.

Consolidation settlement comprises two phases: *primary* consolidation settlement and *secondary* consolidation settlement. The fundamentals of primary consolidation settlement have been explained in detail in Section 1.14. Secondary consolidation settlement occurs after completion of the primary consolidation that is caused by slippage and reorientation of soil particles under sustained load. Primary consolidation settlement is more significant than secondary settlement in inorganic clays and silty clay soils. However, in organic soils, secondary consolidation settlement is more significant.

The settlement of foundations discussed in Section 3.2 for bearing capacity tests was primarily the elastic type. The procedure for calculating each type of foundation settlement is discussed in more detail in the following sections.

3.10 Elastic Settlement

Figure 3.12 shows a shallow foundation subjected to a net force per unit area equal to q_o. Let the Poisson's ratio and the Young's modulus of the soil supporting it be μ_s and E_s, respectively. Theoretically, if $D_f = 0$, $H = \infty$ and the foundation is perfectly flexible, the elastic settlement can be expressed as (Harr, 1966)

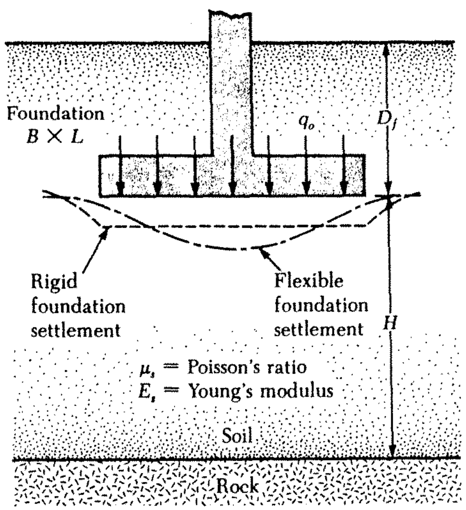

Figure 3.12 Elastic settlement of flexible and rigid foundations

$$S_e = \frac{Bq_o}{E_s}(1-\mu_s^2)\frac{\alpha}{2} \quad \text{(corner of the flexible foundation)} \tag{3.58}$$

$$S_e = \frac{Bq_o}{E_s}(1-\mu_s^2)\alpha \quad \text{(center of the flexible foundation)} \tag{3.59}$$

where
$$\alpha = \frac{1}{\pi}\left[ln\left(\frac{\sqrt{1+m^2}+m}{\sqrt{1+m^2}-m}\right) + m\,ln\left(\frac{\sqrt{1+m^2}+1}{\sqrt{1+m^2}-1}\right)\right] \tag{3.60}$$

$$m = B/L \tag{3.61}$$

B = width of foundation
L = length of foundation

The values of α for various length-to-width (L/B) ratios are shown in Figure 3.13. The average elastic settlement for a flexible foundation can also be expressed as

$$S_e = \frac{Bq_o}{E_s}(1-\mu_s^2)\alpha_{av} \quad \text{(average for flexible foundation)} \tag{3.62}$$

Figure 3.13 also shows the values of α_{av} for various types of foundation.

However, if the foundation shown in Figure 3.12 is rigid, the elastic settlement will be modified and can be expressed as

$$S_e = \frac{Bq_o}{E_s}(1-\mu_s^2)\alpha_r \quad \text{(rigid foundation)} \tag{3.63}$$

The values of α_r for various types of foundation are given in Figure 3.13.

The preceding equations for elastic settlement have been obtained by integrating the strain at any given depth below the foundations for limits of

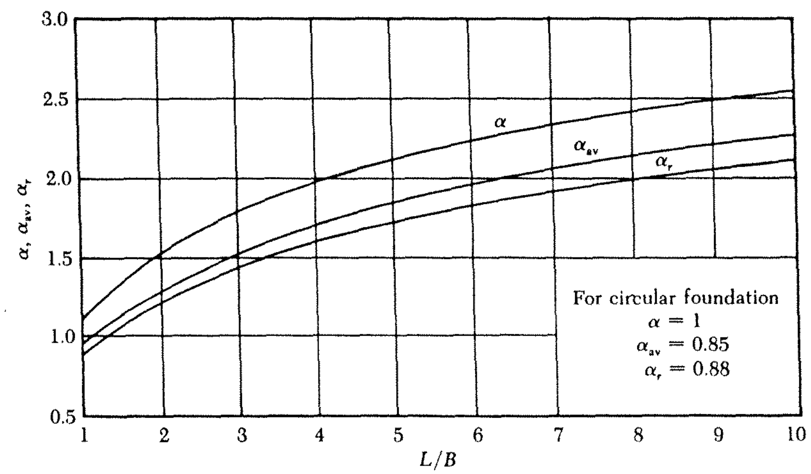

Figure 3.13 Values of α, α_{av}, and α_r—Eqs. (3.58), (3.59), (3.62), (3.63)

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Reference 9

total accumulated ESAL, for each of the four axle configurations, during the design period. The current 10 and 20-Year ESAL Constants are shown in Table 603.3A.

Table 603.3A
ESAL Constants

Vehicle Type	10-Year Constants	20-Year Constants
2-axle trucks	690	1380
3-axle trucks	1840	3680
4-axle trucks	2940	5880
5-axle trucks or more	6890	13 780

The ESAL Constants are used as multipliers of the expanded AADTT to determine the total design period ESAL's and in turn the Traffic Index (TI). The ESAL's and the resulting TI are the same magnitude for both AC and PCC pavement design alternatives.

The distribution of truck traffic by lanes must be considered in the structural section design for all multilane facilities. It is readily apparent that the distribution by lanes varies widely depending on a number of factors including overall traffic volumes, number of lanes, location (urban or rural), proximity of ramps to and from commercial and industrial areas, etc. Truck traffic is generally lightest in the median lanes with progressive increases toward the outside lanes. At locations with closely spaced on-ramps and off-ramps, during heavy traffic periods the lane next to the outside lane becomes the heavy truck traffic lane. Also, unusual events such as accidents, slides, slipouts, and maintenance and repair work create unpredictable shifts of traffic between lanes. In addition, future widening may create a permanent shift in lane distribution during the design life of the pavement structural section. Because of the uncertainties and the variability of lane distribution of trucks, arbitrary lane distribution factors have been established for design purposes as shown in Table 603.3B.

Table 603.3B
Lane Distribution Factors for Multilane Roads

Number of Lanes in One Direction	Factors to be Applied to Expanded Average Daily Trucks			
	Lane 1	Lane 2	Lane 3	Lane 4
One	1.0	-	-	-
Two	1.0	1.0	-	-
Three	0.2	0.8	0.8	-
Four	0.2	0.2	0.8	0.8

NOTES:
1. Lane 1 is next to the center line or median.
2. For more than four lanes in one direction, use a factor of 0.8 for the outer two lanes and any collector lanes and a factor of 0.2 for all other lanes.

Finally, an expansion factor is developed for each axle classification. In its simplest form, the expansion is a straight-line projection of the AADTT data. When using the straight-line projection the data is projected to find the AADTT at the middle of the design period, thus representing the average AADTT for each axle classification for the design period. The expanded AADTT, for each axle classification, is multiplied by the appropriate lane distribution factor (fraction of the total AADTT) to arrive at the expanded AADTT for the lane. The lane AADTT is multiplied by the design period ESAL constant for each corresponding axle classification. Finally, the summation of these totals equals the total one-way ESAL's for the lane which is converted into the TI for the lane.

When other than a straight-line projection of available truck traffic data is used for design purposes, the procedure to be followed in developing traffic projections will vary. It will be dependent on a coordinated effort of the District's Planning and Traffic Divisions working closely with the Regional Agencies.

(2) *Shoulder Traffic.* AC shoulders adjacent to the outer lane (with either AC or PCC pavements on the mainline) are designed for the TI determined from 2% of the ESAL of

the outer lane, however, a TI less than 5.0 should not be used. The design of inner shoulders is covered under Index 603.3(5) and Index 608.5. When PCC pavement and shoulders are used, the design is a standard structural section as covered in Topic 607.

(3) *Ramp Traffic.* Estimating future truck traffic on ramps is more difficult than on through traffic lanes. The relative effect of commercial and industrial development of an area is much greater on ramp truck traffic than it is on mainline truck traffic.

Ramp traffic is relatively more destructive to pavement than through traffic because of the greater amount of acceleration and deceleration that occurs. The sharper curvature and steeper grades normally encountered on ramps also contribute to the increased destructive effect of traffic.

Repair of the structural section elements of ramps usually requires more complex traffic control procedures, especially in urban areas. In order to minimize the potential congestion, traffic delay, highway workers exposure to traffic, and out-of-the-way travel, ramps especially in urban or industrial areas should be designed for a higher TI than that determined from a projected ramp AADTT.

As an alternative to estimating and projecting an AADTT to determine the ramp TI, ramps may be classified and designed as follows:

(a) Light Traffic Ramps - Ramps serving undeveloped and residential areas should be designed for a TI of 8.0.

(b) Medium Traffic Ramps - Ramps in metropolitan areas, business districts, or where increased truck traffic is quite likely to develop because of anticipated commercial development within the design period should be designed for a TI of 10.0.

(c) Heavy Traffic Ramps - Ramps that serve weigh stations, industrial areas, truck terminals, and/or maritime shipping facilities during the design period should be designed for a TI of 12.0.

When ramps are widened to handle truck off-tracking, the full structural section, based on the ramp TI, should be extended to the inner edge of the required widening, see 504.3(1)(b).

(4) *Auxiliary Lane Traffic.* Because of structural section drainage considerations, the auxiliary lane structural section should have the same thickness for the pavement, base, and subbase layers as those specified for the adjoining outer lane of the traveled way.

(5) *Median Shoulder Traffic.* Paved medians are subject to occasional use by maintenance trucks and other heavy maintenance vehicles. Occasionally, disabled heavy commercial vehicles or emergency vehicles may use the median. Generally, medians less than 3.6 m in width on all paved 4-lane cross sections are constructed with the same structural section as the median traveled way lane. Median shoulders on 4-lane divided highways are arbitrarily paved with 60 mm of AC over a variable AB thickness.

When there is a potential for restriping to add a lane or lanes to carry mainline or high occupancy vehicle traffic, an estimate of traffic should be made. This and other pertinent factors should be considered in determining the structural section under the median shoulder.

603.4 Traffic Index

The Traffic Index or TI is a measure of the number of ESAL's expected in the design lane over the design period. The TI does not vary directly with the ESAL's but rather according to the following exponential formula and as illustrated in Table 603.4A.

$$TI = 9.0 \times (ESAL/10^6)^{0.119}$$

Where:

TI = Traffic Index

ESAL = Equivalent 80 kN Single Axle Loads

Table 603.4B illustrates the determination of the TI for outside and median lanes of an 8-lane freeway. The expanded AADTT and the TI's shown in Table 603.4B are taken from the flexible pavement design example (described in Index 608.4) and are not intended to be used in the design for a specific project.

Table 608.4

Gravel Equivalents of Structural Layers (mm)

Actual Thickness of Layer	ASPHALT CONCRETE (DGAC) Traffic Index (TI) 5 & below	5.5 6.0	6.5 7.0	7.5 8.0	8.5 9.0	9.5 10.0	10.5 11.0	11.5 12.0	12.5 13.0	13.5 14.0	14.5 & up	BASE AND SUBBASE ACB; LCB	CTPB; CTB (Cl. A)	ATPB	CTB (Cl. B)	AB	AS
	Gravel Factor (G_f)																
	G_f varies with TI[4]											G_f constant					
(mm)	2.54	2.32	2.14	2.01	1.89	1.79	1.71	1.64	1.57	1.52	1.46	1.9	1.7	1.4	1.2	1.1	1.0
30	76	70	64	60	57	54	51	49	47	46	44	--	--	--	--	--	--
45	114	104	96	90	85	81	77	74	71	68	66	--	--	--	--	--	--
60	152	139	128	121	113	107	103	98	94	91	88	--	--	--	--	--	--
75	191	174	161	151	142	134	128	123	118	114	110	--	--	105[2]	--	--	--
90	229	209	193	181	170	161	154	148	141	137	131	--	--	126	--	--	--
105	267	244	225	211	198	188	180	172	165	160	153	200	180[2]	147	126	116	105
120	305	278	257	241	227	215	205	197	188	182	175	228	204	168	144	132	120
135	343	313	289	271	255	242	231	221	212	205	197	257	230	189	162	149	135
150	381	348	321	302	284	269	257	246	236	228	219	285	255	210	180	165	150
165	421	392	362	338	318	301	287	275	264	254	247	314	281	231	198	182	165
180	473	441	407	380	357	338	322	308	296	285	278	342	306	252	216	198	180
195	526	490	453	422	397	377	359	343	329	317	309	371	332	273	234	215	195
210	--	541	500	466	439	416	396	379	363	350	341	399	357	--	252	231	210
225	--	593	548	511	481	456	434	415	399	384	374	428	383	--	270	248	225
240	--	647	597	557	524	497	473	452	434	418	407	456	408	--	288	264	240
255	--	--	647	604	568	538	513	491	471	453	442	485	434	--	306	281	255
270	--	--	698	652	613	581	553	529	508	489	477	513	459	--	324	297	270
285	--	--	--	701	659	625	595	569	546	526	512	542	485	--	342	314	285
300	--	--	--	750	706	669	637	609	585	563	548	570	510	--	360	330	300
315	--	--	--	801	753	714	680	650	624	601	585	599	536	--	378	347	315
330	--	--	--	--	802	759	723	692	664	639	623	--	--	--	--	--	330
345	--	--	--	--	851	806	767	734	705	679	661	--	--	--	--	--	345
360	--	--	--	--	900	853	812	777	746	718	699	--	--	--	--	--	360
375	--	--	--	--	--	901	858	820	787	758	738	--	--	--	--	--	375
390	--	--	--	--	--	949	904	864	830	799	778	--	--	--	--	--	390
405	--	--	--	--	--	998	950	909	873	840	818	--	--	--	--	--	--
420	--	--	--	--	--	--	997	954	916	882	859	--	--	--	--	--	--
435	--	--	--	--	--	--	1045	1000	960	924	900	--	--	--	--	--	--
450	--	--	--	--	--	--	1094	1046	1004	967	942	--	--	--	--	--	--
465	--	--	--	--	--	--	--	1093	1049	1010	984	--	--	--	--	--	--
480	--	--	--	--	--	--	--	1140	1094	1054	1026	--	--	--	--	--	--
495	--	--	--	--	--	--	--	1188	1140	1098	1069	--	--	--	--	--	--
510	--	--	--	--	--	--	--	--	1187	1143	1113	--	--	--	--	--	--
525	--	--	--	--	--	--	--	--	1233	1188	1156	--	--	--	--	--	--
540	--	--	--	--	--	--	--	--	1280	1233	1201	--	--	--	--	--	--
555	--	--	--	--	--	--	--	--	--	1279	1245	--	--	--	--	--	--
570	--	--	--	--	--	--	--	--	--	1325	1290	--	--	--	--	--	--
585	--	--	--	--	--	--	--	--	--	1372	1336	--	--	--	--	--	--
600	--	--	--	--	--	--	--	--	--	--	1382	--	--	--	--	--	--

Notes:

1. See Tables 605.1 and 608.2 for subbase, base and asphalt concrete types, abbreviations, and gravel factors (G_f).
2. Standard layer thicknesses of 75 mm and 105 mm have been adopted respectively for ATPB and CTPB. These in turn correspond respectively to GEs of 105 mm and 180 mm. As discussed in Index 606.2(3), a thicker TPB drainage layer may be considered only under a unique combination of conditions.
3. OGAC may be substituted for up to 30 mm of DGAC, as a surface layer, when warranted by conditions discussed under Index 608.2(2), the difference in G_f not withstanding.
4. DGAC G_f also increases as the thickness increases, if the thickness is greater than 150mm - See Index 608.4(3)(g).

Appendix 12

Additional Asphalt Pavement Specifications

TECHNICAL MEMORANDUM

URS

2020 E. First Street, #400
Santa Ana, CA 92705
714 835-6886 Tel
714 667-7147 Fax

To:	Kathy San Miguel Department of Toxic Substances Control
From:	Da Cheng Wu, URS Laurie Fernandez, URS
cc:	Curt Christensen, Square D Company
Date:	April 6, 2004
Project No.:	29864170.09050
Re:	Additional Asphalt Pavement Specifications Drive Area, Southeast Corner of North Post-Closure Area Former Square D Facility, Beaumont, California

INTRODUCTION

This Technical Memorandum provides the specifications to place additional asphalt over the existing asphalt pavement section of the southeast corner of the North Post-Closure Area (NPCA; site) at the former Square D Company (Square D) facility in Beaumont, California. The area for the asphalt overlay consists of a drive area for truck traffic at the southeast corner of the NPCA. URS Corporation (URS) conducted an evaluation to assess whether the pavement could handle the loading of 18-wheeler trucks (URS, February 25, 2004). Based on the calculations presented in the evaluation, an additional thickness of 6 inches of asphalt is required on top of the existing pavement to adequately support the upper-bound of anticipated daily truck traffic. The Department of Toxic Substances Control (DTSC) reviewed the February 25, 2004 Technical Memorandum and approved the placement of the additional layer of asphalt pavement. The route of truck traffic and area of additional pavement is shown on Figure 1.

ADDITIONAL ASPHALT OVERLAY

The 6-inch thick asphalt concrete (AC) overlay will extend the length and width of the truck drive area as shown on Figure 1. The drive area is 29 feet wide along the northeast-southwest trending northern portion and 24 feet in width along the north-south trending southern portion. The eastern edge of the drive area will be delineated with an 8-inch AC berm. Along the western edge, the asphalt will extend to the toe of the NPCA slope (Figure 1).

ASPHALT PLACEMENT

All asphalt-related work should be performed in accordance with the latest edition of Section 19 requirement of Caltrans Standard Specifications, and recommendation contained herein. It is recommended that inspection and testing be performed during the construction.

For all flexible pavements, it is imperative that special attention be given to mix design and compaction requirements. A copy of the approved mix design (field samplings/laboratory test results) for the AC and summary of all field compaction records shall be provided to the owner at the conclusion of the construction activities. Copies of all field temperature measurements for the AC (hauled and placed) and ambient shall be submitted at project closeout for records.

Appropriate measures shall be taken to prevent damage to adjacent structures and utilities (if any). It should be noted that it is the responsibility of the Contractor to oversee the safety of the workers in the field during construction. The Contractor shall conform to all applicable occupational safety and health standards, rules, regulations, and orders established by the State of California.

MATERIAL SPECIFICATIONS

Material specifications shall conform to the following Caltrans Standards and Special Provisions:

Asphalt Concrete - Asphalt concrete shall be of Type A, 19-mm maximum, coarse gradation. It shall conform to Section 39, "Asphalt Concrete", of the Caltrans Standard Specifications.

EXECUTION

A. The required additional thickness of asphalt concrete is 6 inches for designated truck-traffic area. The new surface should blend into the ascending slope along the western boundary, while an 8-inch berm shall be placed along the eastern edge of the traveled area.

B. The surface should have a drainage gradient of 2 percent or greater, to existing drainage devices.

C. The existing asphalt surface should be dry and free of foreign materials before work. The surface should then be primed with asphalt primer at a uniform rate and temperature recommended by the manufacture.

D. Asphalt concrete courses should be placed in compacted lifts of 3 inches or less.

E. At the time of delivery to the site of work, the temperature of mixture shall not be lower than 280 degrees F or higher than 320 degrees F. Asphalt concrete shall not be placed when atmospheric temperature is below 40 degrees F or during unsuitable weather.

F. The asphalt concrete should be rolled with a 2-axle tandem roller weighing at least 5 to 8 tons. In areas too small for the roller, use a vibrating plate compactor or hand tamper to obtain compaction.

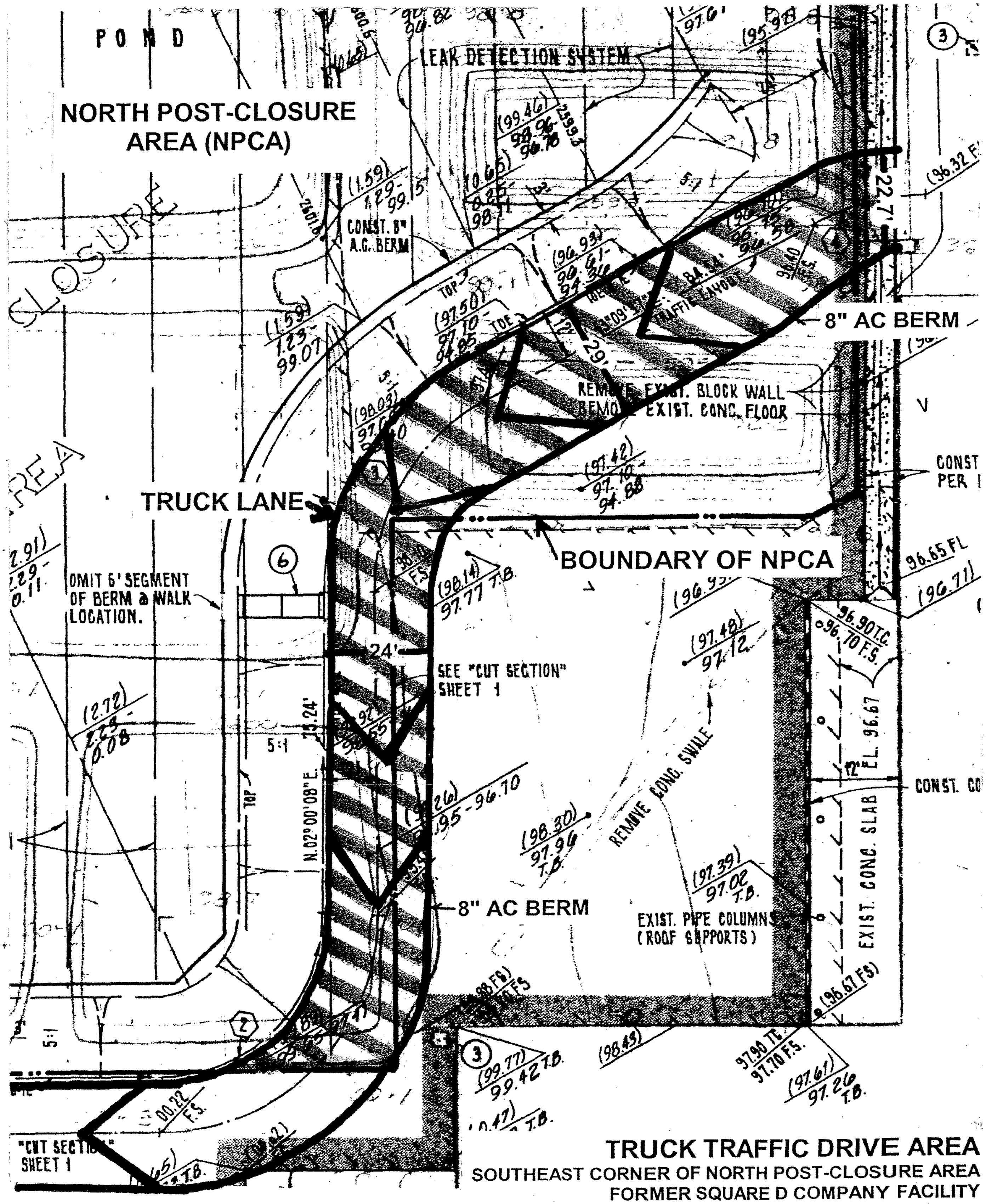
G. The asphalt should be compacted to a minimum of 95 percent of maximum density.

H. The pavement surface, when completed, shall be smooth, dense, well-bonded, and of uniform texture and appearance. All areas shall drain. Flow lines shall be free of depressions which permit water to stand.

I. Seal coat should be applied at the completion.

ATTACHMENTS:

Figure 1 – Truck Traffic Drive Area



TRUCK TRAFFIC DRIVE AREA

SOUTHEAST CORNER OF NORTH POST-CLOSURE AREA
FORMER SQUARE D COMPANY FACILITY
BEAUMONT, CALIFORNIA

APPROXIMATE SCALE: 1"= 30'

AREA OF 6" ASPHALT OVERLAY

FIGURE 1

URS

Reference: As-Builts, 5-28-88, Final Grade Elevations, Sheet 2 of 2

Linda S. Adams
Secretary for
Environmental Protection

Department of Toxic Substances Control

Maureen F. Gorsen, Director
8800 Cal Center Drive
Sacramento, California 95826-3200

Arnold Schwarzenegg
Governor

MEMORANDUM

TO: Kathy San Miguel
Corrective Action and Geological Services
Southern California Region
Cypress, CA

VIA: John Hart, P.E //Original signed by//
Chief, Engineering Services Unit

FROM: Ram Ramanujam, P.E.
Hazardous Substances Engineer
Engineering Services Unit

6/30/07

DATE: August 31, 2006 //Original signed by//

SUBJECT: Revised Pavement Evaluation – Former Square D Facility – Beaumont, CA

Per your request, I reviewed the following documents:

Revised Pavement Structural Section Evaluation for the Drive Area, Southeast Corner of the North Post-Closure Area, Former Square D Company Facility – Beaumont, CA (Prepared by URS Corporation, February 25, 2004).

Additional Asphalt Pavement Specifications - Drive Area, Southeast Corner of North Post-Closure Area, Former Square D Facility, Beaumont, CA (prepared by URS, April 6, 2004).

Truck Traffic on Southeast Corner of North Post Closure Area and Video Surveillance Procedure (Prepared by Schneider Electric, February 23, 2004).

SUMMARY:

The Revised pavement Structural section Evaluation for the Drive Area, SE Corner, Former Square D Facility, Beaumont appears to be reasonable. The evaluation follows the acceptable engineering procedures.

The proposed specifications are appropriate for the construction of the asphalt pavement at the site area.

The additional asphalt thickness is needed to support the truck traffic. The design criteria used for the asphalt thickness are as follows:

. Daily truck traffic: 5 to 10 trips
. Total truck load: 80 kips.

It is important that the field operations procedure follows these criteria. Also, the truck traffic is <u>restricted</u> only on the proposed drive area with additional asphalt thickness.

I would like to visit the site during the construction of the asphalt pavement. Please let know the project schedule.

If you need any clarification on this memorandum, please give me a call at 916/255-6662.